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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/588,243

03/14/2007

Michael Indlekofer

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535 7590 04/29/2008

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EXAMINER

SANDVIK, BENJAMIN P

ART UNIT

PAPER NUMBER

2826

MAIL DATE

DELIVERY MODE

04/29/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/588,243	INDLEKOFER ET AL.	
	Examiner	Art Unit	
	Ben P. Sandvik	2826	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 and 3-13 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1 and 3-13 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>8/2/2006</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1 and 3-13 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ugajin et al (U.S. Patent #5608231), in view of Mimura (U.S. Patent #4424525), further in view of Hayashida (U.S. PG Pub #2002/0017690).

With respect to **claims 1 and 3**, Ugajin teaches a first material region (Fig. 8, 3) and a second material region (Fig. 8, 2), wherein the second material region epitaxially surrounds the first material region and forms an interface (Col 10 Ln 13-18), and that the first material region forms a quantum well for free charge carriers (Col 9 Ln 30-31), but does not teach that the materials of the first and of the second material regions and/or their dimensions and/ or their dopings being such that a Fermi-level-pinning is observed at the epitaxial interface of the second material region opposite to the interface of both material region. Mimura teaches a channel region having a surface with Fermi level pinning (Col 11 Ln 41-46). It would have been obvious to one of ordinary skill in the art at the invention was made to pin the Fermi level at the surface of layer 2 in Ugajin in order to fix the surface potential of the layer. Furthermore, Ugajin does not teach that the second material region having several clamp-like surfaces provided

epitaxially to each other. Hayashida teaches a semiconductor substrate clamp elements formed thereon (Paragraph 27). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide clamps on the device of Ugajin in order to protect the circuit from electrical damage.

With respect to **claim 4**, Ugajin teaches a further material region (Fig. 8, 1) is epitaxially provided, such that Fermi-Level-Pinning is only present at the nonepitaxial interface opposite to the epitaxial interface between the second and the further material region.

With respect to **claim 5**, Ugajin teach that the first material region has a dimension o f 0.5 to 50 nm (Col 11 Ln 30-31).

With respect to **claim 6**, Ugajin does not teach that the shortest distance of the quantum well to the nonepitaxial interface where the Fermi-Level-Pinning is observed does not fall below the size of the depletion length d . Mimura teaches that the shortest distance of the quantum well to the nonepitaxial interface where the Fermi-Level-Pinning is observed does not fall below the size of the depletion length d (Figs, 14 and 15; and Col 11 Ln 41-57). It would have been obvious to one of ordinary skill in the art at the time the invention was made to for the shortest distance of the quantum well to the nonepitaxial interface of Ugajin as taught by Mimura in order to have the device function in the enhancement mode.

With respect to **claim 7**, Ugajin teaches a material for a further material region with is identical to the material of the first material region (Fig. 8, 1, GaAs).

With respect to **claim 8**, Ugajin teaches that a metal is used as material for a further material region (Col 8 Ln 54).

With respect to **claim 9**, Ugajin does not teach the materials of the first and of the second material regions show quasi lattice matching and are provided dislocation-free to each other. Mimura discloses that the materials taught by Ugajin, AlGaAs and GaAs show quasi lattice matching (Col 15 Table).

With respect to **claim 10**, Ugajin teaches $\text{Al}_y\text{Ga}_{1-y}\text{As}$ and $\text{Al}_x\text{Ga}_{1-x}\text{As}$ as materials for the first or respectively second material region with $x>y$ for the formation of a step in the quantum well (first material is GaAs, second material is AlGaAs; hence $y=0$ and $x=1$).

With respect to **claim 11**, Ugajin does not teach that a concentration of free charge carriers of at least 10^{10} cm^{-3} , particularly of at least 10^{16} cm^{-3} in the first material region. Mimura teaches a well region doped to a concentration of at least 10^{16} cm^{-3} (Col 14 Ln 21-22). It would have been obvious to one of ordinary skill in the art at the time the invention was made to provide a concentration of at least 10^{16} cm^{-3} in the first material region of Ugajin as taught by Mimura in order to provide electrons for the operation of the device.

With respect to **claim 12**, Ugajin teaches a metal Schottky electrode with gate function for the control of the charge carriers (Col 9 Ln 53-54).

With respect to **claim 13**, Ugajin teaches a transistor.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ben P. Sandvik whose telephone number is (571) 272-8446. The examiner can normally be reached on Mon-Fri.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Sue Purvis can be reached on 571-272-1236. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/B. P. S./
Examiner, Art Unit 2826

/Evan Pert/
Primary Examiner, Art Unit 2826